

PLANNING FOR A RESPONSE TO SMALL AIRPLANE EMERGENCIES

STRATEGIC MANAGEMENT OF CHANGE

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ABSTRACT

This applied research project identified planning requirements for an effective emergency response to small plane emergencies within the city limits of Alameda, California. The problem was that the Alameda Fire Department (AFD) did not have a published emergency response plan for off-airport accidents involving small airplanes in Alameda, which is adjacent to a major airport. The purpose of this project was to develop such a plan. The “action research method” (defined in the introduction) was used. to identify (1) laws, regulations and recommendations relating to general aviation accidents, (2) types of small airplane accidents and associated injuries that could occur within Alameda City limits, (3) emergency plans that other Fire Departments in Alameda County had in place to respond to general aviation accidents, and (4) intrinsic considerations in the development of a plan.

The procedures included a review of local, state, federal and private organization regulations, guidelines and plans. Portions of the Change Model from the Strategic Management of Change course were used to outline many of the procedures. AFD personnel provided information on past events, and a review of internal city plans and policies completed the reference search.

The results were clear. Specific response guidelines identified from the research were recommended for the AFD. The results answered the questions and addressed the issues of necessary training, airplane safety features, multi-agency coordination, communication and mutual aid. A response plan was

drafted and is included as Appendix A; it is recommended that AFD adopt this plan for responding to small airplane emergencies. Appendix A should also be used as the groundwork for developing a more comprehensive response plan for all types of aviation emergencies, including development of mutual aid plans, compiling resource lists, scheduling joint training with other agencies, while involving the labor group throughout the process.

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INTRODUCTION

The City of Alameda, California, is located in the San Francisco Bay Area, adjacent to the City of Oakland. The Oakland International Airport is situated immediately adjoining portions of Alameda and has numerous commercial as well as general aviation flights arriving and departing 24 hours a day. Most of the general aviation aircraft flight patterns involve paths directly over segments of Alameda. Given the rapidly changing weather conditions, the large amount of congested air traffic, and the high number of student and private pilots that frequent the Oakland International Airport, there is moderate potential for an off-airport accident within the Alameda city limits.

The problem for this project is that Alameda currently lacks a published emergency response plan for off-airport accidents involving general aviation aircraft, specifically small airplanes. The purpose of this applied research project was to develop an emergency response plan for off-airport accidents involving small airplanes that occur in the City of Alameda.

During the course of this study, the “action research method,” which involves an extensive literature search to answer specific questions (see Research Methodology section), was utilized to answer the following questions:

- 1. What are the laws, regulations or recommendations relating to general aviation accidents?**
- 2. What types of small airplane accidents and associated injuries could occur within Alameda City limits?**

3. What emergency plans do other Fire Departments in Alameda County have in place to respond to general aviation accidents?
4. What are the intrinsic considerations in the development of a plan?

BACKGROUND AND SIGNIFICANCE

This research project is a requirement of the National Fire Academy Course titled *Strategic Management of Change* (SMOC). The topic was chosen because of a need at the Alameda Fire Department and its relevance to the SMOC course.

Specifically, the relevance to the SMOC course is twofold: (1) the ability to approach a problem from new perspectives using the *SMOC* change model procedure and (2) to seek out new ideas through standard research methods in order to achieve desired results. Components of the SMOC change model process were utilized to outline the format and procedures of this research effort.

#1. Laws, regulations or recommendations relating to general aviation accidents.

Specific laws, regulations and recommendations will be discussed in the literature review section; this section provides the background information on the agencies responsible for regulating activities related to small aircraft accidents. Those that will be discussed below include the Federal Aviation Administration, the National Transportation Safety Board, the National Fire Protection Association, the Insurance Services Office and the California Occupational Safety and Health Administration.

The Federal Aviation Administration (FAA) is responsible for insuring the

safe, efficient and secure use of the nation's airspace by developing and enforcing safety regulations for all aircraft. One example of the FAA's responsibilities is to rate airports into categories in order to provide aircraft requirements and regulate air traffic conditions in controlled areas. Another is to establish the requirements for aircraft equipment and pilot licensing (FAA/AIM, 1998).

The National Transportation Safety Board (NTSB) is an independent federal agency that investigates every civil aviation accident in the United States and issues safety recommendations to prevent future accidents. NTSB investigators are on call at all times each day of the year (NTSB Online, May, 2000).

The National Fire Protection Association (NFPA) is an international, non-profit membership organization founded in 1896. Although the NFPA does not necessarily have regulation authority, it is the leading worldwide advisor on the topics of fire safety and protection. The NFPA proposes in its guidelines the recommended standard operating response procedures, equipment, training, extinguishment methods and rescue techniques for various firefighting disciplines. (NFPA Online, June, 2000). The Alameda Fire Department (AFD) adopts the NFPA in reference by code and does strive to comply with a majority of its requirements.

The Insurance Services Office (ISO) independently rates fire departments every ten years to review public fire suppression capabilities, and to develop a Public Protection Classification for insurance rating purposes. In 1982 the AFD

received a rating of Class 3 based on an ISO evaluation. Later, in 1992, the department's rating was upgraded to Class 2, receiving a final score of 40.62% out of a possible 50%. The AFD is due for another review in the year 2002 (Barbara Hill, ISO, personal communication, memo dated December 10, 1992).

The State of California governs its own workplace safety and health program according to the provisions of the Federal Occupational Safety and Health Act of 1970. Under that legislation a state can manage its own occupational and safety program provided it meets certain federal requirements. The California Occupational Safety and Health Administration(Cal/OSHA) is such a program and is approved by federal OSHA. Cal/OSHA is a regulatory authority that covers most California workers and can be found in the California Code of Regulations, Title 8, Industrial Relations. (Cal-OSHA, Online, June, 2000).

#2. Types of small airplane accidents and associated injuries that could occur within Alameda City limits.

In this section accidents that have occurred in the vicinity of the City of Alameda are discussed. The types of accidents and associated injuries that could occur in the future are discussed in a later section.

Historically, the City of Alameda has experienced several aircraft accidents within its jurisdictional response area. The Alameda Naval Air Station (NAS) was closed on April 27, 1997. When it was in full operation the NAS had an active airport and a naval aircraft squadron. Quite frequently naval aircraft would fly over the City of Alameda during landing and takeoff. There is presently no plan to

reopen that airport as a public airport, although that possibility exists.

There have been at least five aircraft accidents in the general vicinity of Alameda since 1950. In 1950 an NAS fighter jet experienced problems after takeoff and crashed into San Francisco Bay; the pilot was rescued. In 1973 an A-7 Corsair Jet crashed into a large apartment complex in Alameda. The pilot and 12 civilians on the ground lost their lives. Six additional surrounding structures were also destroyed by fire. In 1980 a helicopter crashed into Alameda High School while transporting an air conditioning unit to the roof. It was suspected that the aircraft ran out of fuel; the pilot was killed. In 1992 an A-4 Jet crashed into San Francisco bay after takeoff, killing the pilot. On August 7, 1997, a Cessna 172 with three members of the Alameda County Narcotics Task Force aboard crashed into a marshy field adjacent to Alameda shortly after takeoff from Oakland International Airport. All three officers experienced blunt trauma injuries and all survived. A major thoroughfare to Alameda was closed for three hours. (Steven Jones, AFD Deputy Chief, personal communication, July 6, 2000).

#3. Emergency plans that other Fire Departments in Alameda County have in place to respond to general aviation accidents.

Specific emergency response plans will be discussed in the next section. This section provides general background on the Alameda County airports.

There are 19 recognized jurisdictional areas in Alameda County. In Alameda County there are three airports, all of which are frequently used by general aviation aircraft, with Oakland International Airport being the most active.

Livermore-Pleasanton and Hayward airports are mostly utilized by general aviation aircraft and also have a high level of air traffic. Neither airport has a dedicated airport firefighting crew; both rely on normal Type-1 structural units to respond to airport, or aircraft emergencies. The Port of Oakland has authority for the Oakland airport and contracts with the Oakland Fire Department for fire protection on the airport property.

The Oakland International Airport is located on approximately 2500 acres; there are 320,750 small aircraft arrivals and departures annually. There is one official flight school on the airport and five flying clubs. There is also a banner towing business that operates year round utilizing general aviation aircraft (Cindy Johnson, Oakland International Airport Marketing Director, personal communication, June, 2000).

#4. Intrinsic considerations in the development of a plan.

This section includes general considerations connected with the City of Alameda and its fire department; the next section provides more detail and specific factors related to aircraft emergencies.

The City of Alameda covers an area of about 12 square miles and is located within the County of Alameda. The total resident population of approximately 79,800 citizens live in 31,413 occupied dwellings according to Alameda County (July, 2000) projections. On any given business day, the worker population is approximately the same as our residence population. In other words, as many residents leave the city as workers come into Alameda on a daily basis thus

making Alameda a densely populated community at all times of the day. In fact, Alameda is the third most densely populated city in Alameda County.

Additionally, tourists can increase the population by up to 20% during summer visits to the State Parks and beaches, holidays and special events. (Bruce Kern, ED of Economic Development Alliance for Business, personal communication, May, 2000).

The City of Alameda is divided into two distinct geographic parts. One is an island which can only be accessed by four drawbridges and two underwater tunnels. The other is part of a peninsula that is immediately adjacent to the Oakland International Airport and the City of Oakland. Another small island that is located within the jurisdictional responsibility area of the City of Alameda is Coast Guard Island. This island is actively operated by the United States Coast Guard on a continuous basis. The City of Alameda has also recently acquired the property that was formerly Alameda Naval Air Station, and is in the process of developing that property. There is an extensive lagoon system that meanders through inland portions of both parts of Alameda. The water surrounding the islands are subject to tidal effects, which can create swift water conditions as well as extreme shallow areas and mud.

The Alameda Fire Department has a total staff of 111 sworn members and emergency services are provided with the standard three-platoon system, three-person companies and a minimum line staffing of 28 personnel daily. Five engine companies, two truck companies, three ambulance transport units and one

Division Chief make up the daily suppression/rescue operations contingent.

There is also a fireboat that is cross-staffed by one of the engine companies. The AFD has recently expanded its services with the closing of the NAS to include confined space rescue. Additionally, with the NAS closure, the AFD has assumed the responsibility for shipboard firefighting on the United States Navy ships that are currently berthed in Alameda. Other new programs consist of Advanced Life Support (ALS) transport and water rescue training on a rigid hull inflatable boat.

The AFD does have mutual response areas in place where automatic responses are dispatched to mutual jurisdictional border areas. All fire departments in Alameda County participate in a County-wide mutual aid effort.

LITERATURE REVIEW

This literature review was conducted to determine what information was contained within published literature that would be applicable to drafting an emergency response plan for general aviation emergencies, and to answer the questions discussed above. Data that were utilized came from sources such as trade journals, research papers, written and verbal correspondence, books, the Internet and local policy.

#1. Laws, regulations or recommendations relating to general aviation accidents.

General aviation is defined by the FAA as that portion of civil aviation which encompasses all facets of aviation except commercial flights (Aeronautical Information Manual (AIM), 1999). Since nearly all privately owned airplanes are

small, this report will focus on small aircraft. A small aircraft is one that weighs less than 12,500 pounds maximum certified takeoff weight (Federal Aviation Regulations (FAR), 1999).

The National Fire Protection Association (NFPA) outlines in Section 1201, Chapter 8-1, requirements that call for appropriate training consistent with areas of responsibilities: "The fire department shall have a training program and policy that ensures that personnel are trained and competency is maintained to effectively, efficiently, and safely execute all responsibilities consistent with the department's mandate". NFPA also recommends general requirements that should be included in ongoing training efforts and for planning purposes (NFPA 1500, 1997, Chapter 3). NFPA does recommend industry standards for aircraft rescue and firefighting operations. These are primarily for airport fire departments but information provided can assist structural firefighting departments in developing methods to deal with similar incidents. (NFPA 402, 1996, Chapter 1).

Responses to downed aircraft outside the critical rescue and firefighting access area need to be expedited in order to be effective in saving lives. Examples of requirements that meet this goal are frequent multi-agency training and annual exercises focusing on compatibility of internal systems with pre-determined jurisdictional responsibility. This would include mutual-aid agreements with various agencies and pre-incident planning. The methods of communicating between the airport, airport fire department and outside agencies

should be established and tested daily. Scene communications could be accomplished through mobile and portable radios, megaphones, cell phones and messengers. Development of a grid map out to 5 miles from the center of the airport could be used to assist multiple agencies to respond. A copy of this map should be kept in air traffic control and distributed to applicable agencies. The map should contain “prominent local features, access routes, staging areas and compass headings should be shown to facilitate locating accident and medical facility sites” (NFPA 402, 1996, Chapter 2).

For rescue purposes special provisions should be considered when airports are near water. The time it takes to perish in an airplane fire is about the same amount of time it takes to drown in water if victims cannot swim, are injured, hypothermic or exposed to fuel vapors. Responders should always assume that there is fuel on the water and take the necessary precautions. Boat launching facilities should be available where bodies of water are present near the airport. The water craft used should be capable of rapid deployment and should hold a large number of people (NFPA 402, 1996, Chapter 4).

When an aircraft accident occurs the Air traffic Control of the closest airport should notify the FAA immediately. The FAA will then notify the NTSB and the Federal Bureau of Investigation. (Sundberg, 1992).

Careful preservation of evidence is a top priority while performing salvage and overhaul procedures. Other agencies may have a responsibility to respond, such as the FBI, NTSB and local and state law enforcement agencies. Every crash

should be considered a crime scene and dealt with in that fashion. Only intervention that allows removal of the victims and stops any spread of fire should be conducted. In order to preserve the scene, the accident site should be secured and only minimal personnel allowed in the area. The accident scene must be left intact insofar as possible, and nothing should be removed from the site. The original position of all controls and switches must be documented; this would apply to victims as well. A videotape recording or photographs of the incident may prove to be valuable to the investigation (Ausmus, 1994).

Proper investigative procedures should be followed before removing the deceased from the accident site. The original location and position of any deceased victims that were moved by responders need to be reported to investigators by the scene commander upon their arrival (Sundberg, 1992).

The ISO has identified training requirements for fire departments as part of its evaluation process. The ongoing training objectives for fire departments are described in the ISO publication, Fire Suppression Rating Schedule as follows(1980, pg.21):

All Company Members: a. 8 half-day (3 hours) sessions, b. 4 half-day (3 hours) multi-company drills, c. 2 night drills (3 hours). Note: A single company drill may receive credit under a and c; a multiple company drill may receive credit under a, b, and c. Company Training: Company training at fire stations, 20 hours per member per month. Classes for Officers: 2 days per year for all officers. Driver and Operator Training: 4 half-day

sessions per year. Training on Radioactivity: half day per member per year.

ISO representatives state that the above guidelines are strictly related to training for structure fires only. Specifically, ISO will grade the ability of a fire department to suppress a fire after it has started and the grading has no bearing on number or causes of fire. Therefore, if training is specifically done on how to extinguish a structure fire resulting from a plane crash, then the training could qualify for accepted training (Tom Geibel, ISO Classification Services Analyst, personal communication, August, 2000).

NFPA 402 (1994, Chapter 12) deals with structural fire department operations that may be required to manage the rescue of aircraft occupants and states, “it is imperative that fire departments located near airports of aircraft flight paths be thoroughly familiar with the recommendations set forth in this guide”.

If large amounts of water are used, the chance of rescuing victims may be improved significantly even if a large amount of fuel is burning. The occupants can also have a high survival rate if the aircraft is not on fire or not severely broken up. Aircraft accidents that occur during takeoff usually involve larger amounts of fuel than in the landing phases. Aircraft that have crashed may have to be stabilized in order to effect a rescue. Firefighters should train in aircraft shoring methods and have appropriate cribbing available. Attack and protection hose lines should always be laid out and charged, and any standing fuel should

be covered with foam. Keeping the fuselage wet is a top priority if fire is present. When fire is seen in the cabin then an aggressive interior attack should be made. When using water on fuel fires firefighters need to be concerned about the run-off and fire that could occur downstream. (NFPA 402, 1996, Chapter 12).

The State of California has its own Occupational and Safety Health Program (Cal-OSHA), and is allowed to do so provided all of the safety and health regulations are at least as stringent as the federal Occupational Health and Safety (OSHA) regulations. Most of the Cal-OSHA requirements are similar to the OSHA requirements. The enforcement regulations that are applicable to any California Code of Regulations, Title 8 such as responses to fire and exposures to toxic chemicals would also apply to any type of related incident such as an aircraft emergency. Most general firefighting activities fall under Title 8, Sub-chapter 7. NFPA recommendations and standards are incorporated only by reference in Cal-OSHA regulations, but as a general rule because NFPA is widely accepted as an industry standard, any recommendations that come from NFPA should be considered as an accepted practice and therefore enforceable. (Rick Ullerich, Cal-OSHA Associated Industrial Hygienist, personal communication, August, 2000).

A recent State of California Assembly Bill was signed into law in October of 1999 and became effective on January 1, 2000. AB1127 revises the Cal-OSHA law regarding penalties and enforcement of standards. It clearly states that now, not only can Cities be subject to civil penalties just like any private sector employer

would be but, under extreme circumstances, individual supervisors and managers may be subject to penalties and even imprisonment (Maria Shanle, City of Alameda, Deputy City Attorney, personal communication, memo dated May 26, 2000).

#2. Types of small airplane accidents and associated injuries that could occur within Alameda City limits.

There have been many major aircraft crashes with few survivors. While these disasters constitute the main body of information that has led first responders to be more effective in their efforts, useful information can also be obtained from the successful handling of small aircraft accidents. The lessons learned from all of these incidents have enhanced our ability to rescue crash victims and to identify the types of injuries to expect. One such lesson deals with the threat of fire, which is considered a predominant risk and the main reason for rapid removal of passengers. With any fire comes the added risk of smoke inhalation, which is more severe in a plane because of the toxic gases that may be introduced into the limited cabin area. Although fire is the most immediate hazard in an airplane crash, it does not necessarily generate the most serious injuries. The most serious injuries are those resulting from trauma related to sudden impact. (Monning, 1986).

A study of aircraft accidents shows that 80% are survivable at the time of impact, however, once fire is involved conditions inside the airplane can become untenable and deadly within a few minutes. It has been shown that 70% of all

deaths in aircraft accidents are from the conditions produced by fire and toxic fumes. Quick and appropriate operations directed toward fire suppression are a crucial factor to saving lives. The application of foam or large quantities of water can extinguish most fires and create a safe path for escaping passengers. This may also be accomplished by pushing the fire away from the aircraft. Handlines should be deployed in case an interior attack is necessary. Any passengers in the airplane should be considered salvageable, and ventilation should be performed quickly to keep the environment as clear as possible. Flammable liquid fires are usually hotter than a typical structure fire, and firefighters should exercise good judgement at all times when involved in fire-fighting operations. (Ausmus, 1994).

A single-engine airplane crashed into a day care center in Pembroke Pines, Florida, on a Saturday when the building was unoccupied. All of the sixty gallons of fuel carried by the plane leaked into the structure. A fuel-fed fire was prevented by proper placement of foam lines, disconnecting the utilities and by using hydraulic extrication tools(Rosenthal, 1988).

Aircraft incidents can occur virtually at any time and any place. These types of disasters can create serious destruction of property, injury and/or loss of life. Emergency personnel must be prepared to handle a variety of circumstances that do not usually occur during conventional firefighting events(Carr, Omans, 1991).

Although the typical plane crash is on the ground or in the water, there are some instances where the plane has not actually touched down. A Cessna 150

crashed into power lines off the airport property in Tukwila, Washington, when it was hit with a gust of air created by a departing aircraft. Upon hitting the power lines one of the wheels became tangled, suspending the airplane sixty feet above the ground. A major hazard in this case was the stability of the airplane: had it fallen it could have injured or killed the pilot or responders on the ground.

Another hazard was that fuel was leaking onto the highway below. Foam was applied to the spill and dikes were applied to prevent further leakage into a storm drain. The ground crews were able to communicate with the pilot with a radio carried on the airport apparatus until the airplanes' battery died. The plane was secured by responders with straps to two cranes. One of the straps was placed around the propeller shaft, which is one of the strongest points on the airplane. The pilot was removed almost three hours after the crash by using an aerial platform. The power company took approximately an hour and a half to shut off power to the lines (Vines, 1998).

An emergency landing in the water is another type of accident that could occur within the Alameda City limits. A small commuter jet carrying 51 passengers and crew crashed on takeoff at La Guardia airport in 1992. The plane cartwheeled on the runway, burst into flames and stopped in the water. One woman regained consciousness only to find herself still in her seat upside down in the water. The tail section was in the water and still on fire and there was fuel in the water. During the rescue operation many of the divers in the water tore their wetsuits on pieces of the airplane, exposing them to freezing water and fuel.

One of the lessons learned was to leave personal belongings with the deceased victims so identification can be made. Responders cited training and use of the Incident Command System as key elements for the successful outcome. Another lesson that proved to be valuable for the responders mental health was the use of Critical Incident Stress Debriefing (CISD) that was made available after the incident (Nordberg, 1992).

Specialized equipment and knowledge is required when rescuing victims from the water. Such a rescue also requires that rescuers be in top mental and physical condition. Responders should be in wetsuits when the temperature of the air and water combined falls below 120 degrees Fahrenheit. Some of the equipment required may include a hoist attachment, knife, smoke flare and flare gun. The risks involved with this type of operation are magnified at night (Garcia, 1988).

Hazardous material placarding required by various transportation methods is not required for airplanes. Responders need to be aware that airplanes may have hazardous materials or dangerous cargo on board. An example might be a crop-duster or agricultural airplane with pesticides on board, or a medical airplane carrying radiological or bio-hazards. Survivors should be questioned on the cargo contained within the airplane as soon as possible (Smith, 1993).

Extricating victims from an airplane can be anything but routine. The crew performing the extrication of patients must be aware of many safety factors. They must know the approximate location of fuel lines in relation to the cabin area.

Responders should also know how to shut down the electrical systems and isolate the battery. A piston powered engine with a propeller is capable of self-starting under certain conditions, even when the engine is not running, which could maim or kill a firefighter (Roper, 1990).

#3. Emergency plans that other Fire Departments in Alameda County have in place to respond to general aviation accidents.

Of the 19 agencies in Alameda County, three currently have airport emergency response plans: Hayward, Livermore-Pleasanton and Oakland Fire Departments.

The City of Hayward has a general aviation airport in its jurisdictional boundaries. The Hayward response plan primarily deals with simplified procedures that utilize terminology familiar to air traffic control personnel. The plan utilizes air traffic controllers' expertise in determining the type and seriousness of any reported aircraft emergency. The plan is divided into eleven sections: The first section deals mostly with response levels. A "stand-by" is any aircraft situation where the tower requires Fire, Police Departments and the ambulance provider to stand-by. The term "code-red" is used for an actual general aircraft emergency. The response level for this type of situation is three engines, one truck, one ambulance and a chief officer. Police are also dispatched to initially maintain control of the incident area.

The second section of the Hayward plan deals with incident report criteria. The minimum information required includes the name, address, birth date and

phone number of the pilot; in addition to the aircraft type, make, model, year and identification numbers.

Sections three and four deal with large commercial aircraft and airport operations. Sections five and six consider apparatus placement and assignments for a downed aircraft. The first engine on scene places the apparatus in an up-wind position where the Stang can reach and cover both sides of the aircraft while setting up for a foam attack. If there is a fire present, the engine will initiate a 30-second foam attack using the Stang while hand foam lines are being placed for use. The first truck on scene will assess aircraft damage, disconnect battery cables and secure any fuel leaks. If there is a fire present then the truck will focus efforts on extrication and rescue of any victims in the aircraft. Other responding units are to be assigned as needed.

Sections eight through ten deal with military aircraft, refueling operations and airport water supply considerations. Section 11 gives procedures for direct communications between the tower and responding units. The tower is equipped with a portable fire department radio that allows them to communicate with first arriving units and dispatch. The tower will contact dispatch via telephone or radio and give the following information: type and location of emergency, type of aircraft, amount of fuel on board, number of persons on board. Dispatch will send the appropriate response units and the tower will monitor the portable radio (Hayward Fire Department, 1993).

The Livermore-Pleasanton Fire Department (LPFD) Airport Plan formulates

procedures for alerting the LPFD and delineates responsibilities of responders and other involved participants.

Livermore Tower (LT) will channel all requests for service through the normal 911 system. The LT will monitor and talk to responding units on a tactical frequency assigned by Livermore Dispatch and communicated to the LT, which in turn only communicates with the first unit on scene or the Incident Commander. LT will perform a portable radio check with the LPFD each morning between 0700 and 0800.

The LPFD Airport Plan has three response levels. Alert Three, the most serious level, occurs when there is an actual accident, and emergency equipment is then dispatched directly to the scene by the LPFD Dispatch. When the incident occurs off of airport property the LT will attempt to estimate and report the location by street name, the type of plane and emergency, aircraft identification number, amount of fuel and number of passengers. Finally, any hazardous cargo and any other significant information will be reported.

The initial response to this type of incident includes three engines and a Duty Chief. When arriving on scene, vehicles will be placed to either side of the actual incident facing away from the downed aircraft (Livermore-Pleasanton Fire Department, 1998).

The Oakland International Airport Operational Guidelines (OIAOG) state that the airport is classed as Index D by the FAA, which requires that the fire department be able to carry and deliver on available apparatus at least 4000

gallons of water and 450 pounds of dry chemical.

There are four alert designations in the OIAOG. Red and Yellow Alerts deal with various emergency states of large aircraft only. An Alert One indicates that a small aircraft (less than 12,500 pounds gross weight) has been involved in an accident or fire on or near the airport. A typical response to an Alert One by off-airport Oakland units is two engines, one truck, one Battalion Chief and one ambulance. An Alert Two means that a small aircraft may have a potential emergency situation.

The first arriving unit will establish command and place the command post at a safe location upwind from the incident. The Incident Commander will then brief any incoming units and coordinate tactical efforts while considering the needs of other outside agencies that may respond such as NTSB. There are many pre-assignments designated in the plan. For example, the first in-airport Captain will become the Fire Attack Group Supervisor upon the arrival of the first Oakland Fire Department Unit. There are nine major assignments that are designated for a large scale disaster; Fire Attack Group, Medical Group, Evacuation/Rescue Group, Triage Team, Casualty Collection Site, Water Supply, Staging Manager, Operations and Incident Commander.

The communications section of the plan deals with how Oakland Fire companies will communicate with the tower, as well as assigned airport units, as they are responding to the airport. Oakland Fire companies report they are responding on their primary frequency, then switch to an assigned tactical

frequency. They also monitor the assigned airport channel with a portable radio while continuing to operate on the tactical frequency. The radio that duplicates the control tower radio is installed in each command vehicle. The tower is responsible for relaying pertinent information to units that are responding to an aircraft emergency. That information includes type of aircraft, nature of emergency, number of persons injured, amount of fuel on board and the estimated time of arrival for the aircraft if applicable.

There are operational criteria scattered throughout the plan and also itemized on specific checklists. Safety gear must be worn by all responders, and there is reference to passport accountability procedures upon arrival on the scene. Once any fire is knocked down, a foam blanket is to be maintained. Crews should always survey the scene area for unburned fuel and secure it with foam blankets, while continuing to eliminate all possible ignition sources from the aircraft. Responders should refrain from compromising the foam blankets once they have been established and continuously monitor the integrity of foam blankets in heavily traveled areas and exit corridors. Personnel must watch for, and prevent, ignition of fires so as to protect victims and responders. At least one responder should be standing by with a charged hose line, and a secondary water supply should be identified.

Extrication may have to be performed and the priority should be concentrated on the victims who are viable and can be dislodged with the least amount of time and effort. This operation should start with an effort to open all

available doors to facilitate the removal of patients and ventilate a potentially toxic environment. A victim count should be ascertained and reported as soon as possible. Once extricated, victims must be moved to a treatment area or collection site that is uphill and upwind of the incident and close to the loading area for ambulances. Enough resources will have to be allocated to properly provide medical assistance and to load any patients. Triage tags should be used on all patients and classified according to the most current operating procedures. Deceased patients should be tagged and left where found. A search should be made for additional victims outside the aircraft. The response team must be aware of depleting the inventory of scene medical supplies such as bandages and backboards (Oakland Fire Department, 2000).

#4. Intrinsic considerations in the development of a plan.

While public interest and support tend to focus on major aircraft incidents, in fact most airplane accidents involve the smaller general aviation-type aircraft. Typically, responses to small airplane crashes involve fire departments and rescue units that normally do not deal with such incidents. As a result, pre-planning and training for these types of emergencies are required to save lives and property. Getting to the site quickly is one of the biggest hurdles facing responders. Knowledge of the flight patterns for a particular airport runway layout can be used to predict where accidents are most likely to occur (Breckel, 1993).

In contrast to the other types of incidents that a fire department responds

to on a daily basis, aviation incidents are a comparatively uncommon occurrence. Yet they can happen at anytime and require the available resources to perform outside the normal call for service. One of the best ways to become familiar with the various types of light airplanes is to contact the nearest airport within a jurisdiction and arrange for a tour for preplanning purposes (Ausmus, 1994)

Many emergency responders believe that small aircraft accidents can be handled like an auto accident. Even though this is partially true, there are some differences to consider that can make a rescue either difficult or effective. When responding to a small aircraft incident crews must consider what safety hazards might be present in the aircraft systems such as leaking fuel, electrical intricacies and oxygen system compromise.

Aircraft usually carry more fuel than automobiles, at least 25 gallons and up to several hundred gallons for twin engines. The fuel normally carried is 100 octane and has the same characteristic as automotive fuel. It is usually carried in the wings, although there are sometimes auxiliary tanks in the fuselage and in the tips of the wings. Each small airplane has a fuel shut-off valve which can be used to stop fuel flow or leaks from the tanks to the engine. The shut-off valve is usually located midline on the floor immediately forward of the front seats and sometimes on the side panel next to the left front seat. Another location to check for the valve would be the lower edge of the instrument panel or on the inside of the aircraft where the wings and the cabin meet. It is important to remember that fuel lines run from the tanks to the engine through the fuselage which might be

compromised during rescue operations.

The electrical system of an airplane is similar to that of an automobile with the primary electrical hazard being the battery. The battery location is not standardized and can be found anywhere from the engine compartment to the furthest rear of the fuselage. Sometimes there is a plastic drain hose on the fuselage that may determine the location of the battery. Some twin engine aircraft may have two batteries. Similar to an auto accident, it is a good practice to disconnect the battery as soon as possible.

The ignition switch only controls the starter and does not shut off the power from the battery. The master switch however, will shut off power to the electrical system and is usually located on the lower portion of the instrument panel. There are usually two switches and it is recommended that both are toggled to the off position.

Some small aircraft may have portable or built-in oxygen systems. An oxygen rich environment can cause a fire to flash or accelerate rapidly. If there are oxygen masks on board then responders should assume that there is an oxygen system and look for a tank in order to attempt to shut it off (Smith, 1993).

Launching an aircraft emergency plan in the City of Alameda competes with many other organizational considerations. The AFD has expanded its services in the last decade, both because of taking over the NAS property and increasing citizen demands for service. Such services include: confined space and technical rescue; water rescue, shipboard firefighting and an upgrade from

Emergency Medical Technician ambulance transport to Advance Life Support (Paramedic) ambulance transport. Because of this expansion, the AFD has been faced with increased emergency response planning and training requirements. The AFD has an extensive training program in which many classes are mandatory. There is now little room for enlargement of the training program. For example, a large majority of AFD personnel have Emergency Medical Technician-Defibrillator (EMT-D) Licenses which require bi-annual refresher training by State law. Among other training requirements, California Occupational Safety and Health Administration (Cal-OSHA) requires fire department training which is dependent on specialized and hazardous operations such as confined space rescue and hazardous material response.

The AFD is currently trained in the Incident Command System (ICS) and utilizes the system on nearly every call for service. It hasn't any specialized equipment for responses to general aviation accidents and must rely on standard firefighting equipment that would normally be carried on fire apparatus. The exception is 10 gallons of foam that is carried on each engine and 100 gallons of foam that is carried on the two engines that were transferred with the NAS base closure. Also all of Alameda Fire Department apparatus carry cell phones. In the area of water rescue, AFD personnel have only been trained to pull victims out of the water into one of two AFD boats. They are not trained to enter swift water conditions. They can effect a still water surface rescue from land with a large surfboard. The fire boat is slow, has firefighting capabilities but does not carry

foam, and has a 44 inch draft. The water rescue boat is a 24 foot rigid hull inflatable that is very fast, has little draft, and has no firefighting capabilities. The confined space team is very limited and is still in its infancy. (Tim McNeil, AFD Deputy Chief, personal communication, July, 2000).

PROCEDURES

Definitions

Alert. A notification of an incident or a potential incident involving aircraft on or near the airport (Oakland Fire Department, 2000).

Civil Aviation. Means aircraft other than public aircraft (Federal Aviation Regulations, 2000).

Confined Space. A space large enough that someone can enter to perform work, has a limited access in and out, and is not designed for continuous occupancy (OSHA 1910.146, 1998).

Critical Rescue and Fire Fighting Access Area. The rectangular area surrounding any runway within which most aircraft accidents can be expected to occur on airports. Its width extends 500 ft from each side of the runway centerline, and its length is 3300 ft beyond each runway end (NFPA 402, 1996, Chapter 1-4).

General Aviation. All civil aviation operations other than scheduled air services and non-scheduled operations for remuneration or hire (Oakland Fire Department, 2000).

Incident. A definite distinct occurrence; an event (Oakland Fire Department, 2000).

Small Aircraft. An aircraft of 12,500 pounds or less, maximum certified take-off weight (Federal Aviation Regulations, 2000).

Small Aircraft. A single or twin-piston-engine non-jet aircraft that carry two to eight passengers (Smith, 1993).

Structure Fire. A fire involving a building or part of a building (Oakland Fire Department, 2000).

Research Methodology

The purpose of this research was to develop an emergency response plan for general aviation small airplane accidents for the Alameda Fire Department. Thus, the research conducted was action research. A problem statement, broad goal, and internal and external considerations effecting the stated purpose were identified. A literature review was undertaken to compile information for planning purposes. This review included information from local, state and federal sources, in addition, airport emergency plans from jurisdictions in Alameda County were used as an initial starting point. Other sources included the Internet, trade journals, aircraft books, personal contacts and the National Fire Academy Inter-Library Loan program.

Portions of the Change Model provided by the National Fire Academy course titled *Strategic Management of Change* provided the steps for proper analysis and planning to respond to change requirements, such as setting

objectives and strategies. Change was required because of an internal functional need in the AFD. A systematic approach was made to identify the conditions present within the AFD organization in order to make a comparison with existing standards and norms in other fire departments that have small airplane emergency response plans. The organizational change requirements examined the perspective, magnitude and objects of change.

The majority of the information from ISO was obtained from a copy of the Fire Suppression Rating Schedule directly from ISO, and from past correspondence in the Central Filing System of the AFD.

NFPA information was obtained from on-site NFPA resources. This information was based on standards relating to aviation accidents, and available data for this topic is covered in Appendix A.

In order to find information on Alameda from an historical viewpoint, long time employees were contacted, and internal plans and policies were reviewed.

Assumptions and Limitations

While there is a large amount of research data available for this topic, there is not a reliable method or means to assure that all requirements, recommendations and standards were captured. It must be assumed that any recommendations found in the research are dynamic in nature. Therefore the outcome of this research may be subject to change due to outside influences and new research found. A limitation is contained within some of the research material since recommendations for emergency response to light airplane

accidents is scattered throughout an extremely large volume of material that primarily deals with large aircraft accidents. No suggestions were found relative to the design or development of a specific plan that would meet all the necessary planning components for fire departments that are close to an airport but do not have jurisdictional responsibility for aviation emergencies on airport properties. Each individual fire department will have its own unique circumstances and priorities. The study is limited to small aircraft and would not include military aircraft, jet aircraft, helicopters or large airplanes. The scope of this study is limited to recommendations for responses to small airplane emergencies that occur within the Alameda City limits.

RESULTS

Components for an emergency response plan to small plane emergencies were identified from the information gathered in the literature review. The results of this research paper corresponds with the published material that was available and reviewed. The final plan elements as they apply to the AFD are shown in Appendix A.

#1. Laws, regulations or recommendations relating to general aviation accidents.

There were no specific laws or regulations found that require a structural fire department to perform in a certain manner when responding to general aviation small airplane emergencies. Although one of the main issues with the FAA and the NTSB has to do with the preservation of the scene; there was no

mention was made about the types of evidence that should be maintained. The only mandatory requirement is to record the original position of a deceased victim if the body is moved. ISO has no related recommendations. FAA defines a small airplane as any aircraft weighing less than 12, 500 pounds. NFPA primarily gives recommendations for airport fire departments, and recommends that structural fire department members become thoroughly familiar with those standards. Those standards should be considered an industry standard and are enforceable by Cal-OSHA. In answering the first question, the following criteria were identified as necessary components of a plan:

- Maintain a training program consistent with areas of responsibilities.
- Establish frequent multi-agency training and exercises focusing on compatibilities.
- Establish mutual aid agreements.
- Promote quick response times that are critical to saving lives.
- Establish communication methods.
- Develop a grid map out to five miles from the center of the airport.
- Establish boat launching facilities where water may be a factor.
- Consider every crash a crime scene.

#2. Types of small airplane accidents and associated injuries that could occur within Alameda City limits.

Current aircraft emergency practices are a result of past experiences, primarily dealing with major airline crashes. Fire is the most immediate hazard

that can result from an aircraft accident, but the most serious injuries generally come from sudden impact trauma. Some of the places where small plane accidents could occur include water, mud, structures, high tension wires or roadways. Responders must be prepared for anything, and non-conventional firefighting methods may be necessary. In answering the second question, the following criteria were identified as necessary components of a plan:

- Quick and appropriate fire suppression operations are necessary.
- Proper application of foam can reduce the threat of, or extinguish, fire.
- Non-standard equipment may have to be utilized, such as cranes.
- Rescue divers with specialized equipment may be necessary.
- Special consideration should be given to cargo.
- A safe path for victims to escape is a tactical priority.
- Safety factors of small airplanes must be identified.

#3. Emergency plans that other Fire Departments in Alameda County have in place to respond to general aviation accidents.

The majority of fire department agencies in Alameda County do not have emergency response plans in place for aircraft incidents. The three plans that do exist primarily focus on large commercial aircraft emergencies. Any aircraft incident that occurs outside airport property becomes the responsibility of the jurisdiction where the aircraft comes to rest (Oakland Fire Department, 2000). In answering the third question, the following criteria were identified as necessary components of a plan:

- **Gathering of appropriate incident report criteria.**
- **Proper apparatus placement.**
- **Scene tactical and safety considerations.**
- **Communications between all responders.**
- **Alert levels consistent with surrounding airports.**
- **Identification of outside mutual aid resources.**
- **Proper use of the Incident Command System.**
- **Personal protective clothing guidelines**
- **Identification of special uses of equipment.**

#4. Intrinsic considerations in the development of a plan.

The City of Alameda is densely populated and mostly surrounded by water. There are few areas large enough to accommodate a successful off-airport emergency landing by a general aviation aircraft. Aviation accidents are a very uncommon occurrence compared to incidents normally encountered by fire departments. In answering the fourth question, the following criteria were identified as necessary components of a plan:

- **Identification of pre-planning measures and criteria may help to save lives.**
- **Tours of different types of planes will help with preplanning.**
- **Aircraft systems such as fuel, electrical and oxygen should be learned.**
- **A skills and equipment evaluation should be performed for applicability.**
- **Extrication and medical treatment need to be considered.**
- **Ongoing evaluation is necessary.**

DISCUSSION

As in previous sections the discussion will be separated according to the four main questions of this paper.

#1. Laws, regulations or recommendations relating to general aviation accidents.

NFPA states that fire departments should establish a list of education and in-service training goals and objectives so that all members can achieve and maintain required proficiencies. Therefore, the AFD emergency response plan should include education and in-service training goals and objectives.

Furthermore, NFPA states that its standards are to be considered criteria for job performance (NFPA 1452, 1993, Chapter 5-2.2):

The standards that comprise the system establish, in terms of job performance requirements, the minimum criteria necessary to perform the specific job function. The standards are not training outlines, they are the criteria for the evaluation of an individual's ability to perform critical job functions.

NFPA recommendations should be followed whenever practical, but sometimes the standards cannot be met due to resource limitations within the organization.

ISO only identifies major topic areas and the corresponding number of hours that are to be covered in its rating schedule related to training. This leaves much room for creativity and subjectivity when it comes to designing a program to meet the ISO criteria. In the research for this paper, it was found that the ISO rating in the area of training is focused only on structural firefighting. Although

the ISO training requirements are not mandatory, it is prudent to consider their rating schedule as a priority because it may affect local insurance rates (ISO, 1980). Clearly, training on an airplane crash scenario in which a structural fire resulted should qualify for an ISO-approved class.

OSHA has published a manual called *Training Requirements in OSHA Standards and Training Guidelines* that is designed to assist agencies in finding references in the Standard that may apply to their organization (OSHA 2254, 1998):

The guidelines afford employers significant flexibility in the selection of content and training and program design. OSHA encourages a personalized approach to the informational and instructional programs at individual work sites, thereby enabling employers to provide the training that is most needed and applicable to local working conditions.

The three areas found to be most applicable from the OSHA standards to small plane emergencies other than firefighting standards include hazardous materials, respiratory protection and blood borne pathogens. These are already integrated into most fire department training programs. However, more Cal-OSHA standards may apply to the AFD than those listed above. Those three areas from Cal-OSHA and OSHA require a specific number of training hours annually, as well as a review of all recommended topics. Again, NFPA standards may be enforceable in a Cal-OSHA action and as a result, these standards should be followed whenever practical.

The NTSB and FAA should be contacted as soon as possible after an aircraft incident, and any aircraft response plan should include contact numbers to the nearest FAA facility, local control tower, nearest Flight Service Station, FBI and U.S. Department of Transportation. Other local notification or resource contact numbers should be included in the plan. The accident must be recreated as completely and accurately as possible in relation to the actual scenario that took place (Smith, 1993).

#2. Types of small airplane accidents and associated injuries that could occur within Alameda City limits.

Airplane accidents can occur at any time and place, under conditions that will vary as a function of the ground environment where the crash occurs. No matter what type of situation that is found upon arrival, emergency crews have to respond quickly and act effectively in order to save lives (Smith, 1993).

The primary task in any aircraft accident is to direct every effort to the saving of lives. This is accomplished through rescue and extrication, as well as establishing and maintaining a safe path for egress, usually through the use of fire streams. The scene must always be approached carefully from upwind and uphill. There may often be debris, casualties and fuel leaks outside the aircraft. These hazards are exacerbated when poor visibility conditions exist due to inclement weather or heavy smoke. Responders must ensure a way out of the incident area (Ausmus, 1994).

A common thread found in reviewing the reports on various airplane

accidents was that, although these incidents happen rarely, they have a high probability of injury to victims and responders. These injuries could be minimized through preplanning and preparation, appropriate initial course of action, scene control, patient management and functional communications. Risk management of these events should be considered a high priority and should incorporate these components into the plan. Scene commanders should also depend on their past incident management experiences to properly handle different types of conditions that may arise during an airplane incident.

#3. Emergency plans that other Fire Departments in Alameda County have in place to respond to general aviation accidents.

Throughout the OIAOG (Oakland Fire Department, 2000) there are numerous citations about the number of units that would be requested or automatically dispatched to the scene of an aircraft incident at the Oakland International Airport. The different levels of alerts designate the severity of emergencies and include the recommendation, or automatic dispatch of, an appropriate minimum number of units to respond or stand by. An AFD engine is listed as an automatic mutual aid resource during a Red and Yellow Alert response level, which corresponds to a large aircraft emergency only. There is not currently a provision in the OIAOG to automatically dispatch an Alameda engine as a mutual aid resource to an Alert 1 or 2 small plane emergency. Additionally, there is no regularly scheduled joint airport familiarization or training, except for the required FAA annual exercises. Because of the close

proximity of these two jurisdictions and the mutual aid responsibilities, the plan that is adopted by Alameda should mirror the OIAOG as closely as possible. The plan should also explore the possibility of ongoing joint training with the Oakland Fire Department and a mutual aid response to an Alert 1 or 2 at the Oakland International Airport. Responding more frequently to small aircraft incidents along with joint training would assist responders in becoming more familiar with small airplane emergencies, the available equipment from Oakland and procedures for airport response. All of these measures would improve response capability relative to aircraft incidents within the City of Alameda.

#4. Intrinsic considerations in the development of a plan.

A functional airplane emergency response plan needs to be short and concise, with generalized decision making responsibilities. It should allow for specific decisions to be made by the responsible persons on the scene of the accident. According to Sundberg (2000) the basic elements of a plan should include “command structure, scene logistics, resource availability, communications, and disposition of survivors and the deceased”. The plan must be practiced in order to be effective. Ongoing practice sessions will pinpoint strengths and weaknesses in the plan as well as responder capabilities. Finally, any plan should be revisited on a regular basis to make any necessary changes (Sundberg, 2000).

Internally the considerations of adopting a plan are many. Available time for training, budget considerations, identification of obtainable resources and a

functional communications network are some of the major issues to be assessed. The boat and water rescue capabilities probably represent the most critical internal factor for the City of Alameda because of the complexity of a water rescue. A sinking airplane needs a rapid response and possible entry into the water in order to save victims. There are many safety issues associated with these two tasks, such as leaking fuel and sharp metal objects in the water.

In order to be effective on small plane incidents, aircraft systems must be reviewed, such as fuel, electrical and oxygen systems. The layout of the airport is critical in determining the flight paths over the City of Alameda and could indicate potential accident locations. For example, the fact that small airplanes usually take off with full fuel tanks and directly over the City of Alameda illustrate the kind of information that responders could use to manage an incident properly.

RECOMMENDATIONS

There is an immediate need for the AFD to have an emergency response plan for small airplane incidents. The following recommendations are made directly from the data collected and results obtained during the research. Additionally, these recommendations address the problem and purpose of the research, i.e. the lack of an emergency response plan to small aircraft incidents, and the development of such a plan. The recommendations should be accepted and integrated into the AFD and definitely could be used for by other agencies for similar responses.

- The AFD should adopt Appendix A as an intermediate plan for response to small airplane accidents. The plan should adopt as much of the NFPA requirements and the applicable OIAOG as practical.
- The emergency response plan to small airplane emergencies that is found in Appendix A represents a key block with which to begin the preparation for emergency response to other types of aircraft emergencies. Future development of a more comprehensive plan encompassing an emergency response to every type of aircraft is highly recommended. Further research on this topic would be beneficial to identify all types of aircraft such as helicopters, large aircraft, hot air balloons and blimps.
- A mutual aid plan should be developed with the Oakland Fire Department Airport Division (OFDAD) to initiate an automatic response to an incident in Alameda. A grid map should be developed during this process to further communications efforts. OFDAD carries a large amount of foam on their apparatus and their personnel have specialized knowledge in these types of incidents.
- A resource list of outside agencies and non-standard equipment that may be required to perform effective operations should be developed.
- A schedule for on-going joint training with the OFDAD should be agreed upon. This training should focus on communications, compatibility of intrinsic systems, airplane construction and systems, and airport tours.
- Multi-agency exercises designed to familiarize and test AFD's abilities to

respond effectively should be scheduled on a regular basis.

The labor group should be involved throughout the entire process. For example, labor should be involved in a task force to conduct a needs assessment for additional boat launch locations and the current water rescue capabilities. The task force should research other delivery methods from various fire departments outside the county in order to gain as many new ideas as possible.

- **Outside governmental agencies such as the FBI, NTSB and Cal-OSHA should be contacted as well for direct planning assistance, coordination and training recommendations.**

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APPENDIX A

Alameda Fire Department

Emergency Response Plan to Small Airplane Incidents in the City of Alameda

Purpose:

This document is intended to provide guidelines for Alameda Fire Department personnel to effectively respond to off-airport small airplane emergencies within the jurisdictional areas of the City of Alameda.

Responsibility:

All sworn members of the Alameda Fire Department shall be responsible for ensuring that the provisions of this policy are adhered to.

Policy:

Overview:

Many general aviation airplanes fly directly over the city limits of Alameda as a result of its close proximity to the Oakland International Airport (OIA); according to the OIA, there are approximately 320,750 general aviation aircraft arrivals and departures annually. Given the high number of general aviation flights, rapid changing weather conditions, congested airspace of the Bay Area and the large number of student pilots, there is a genuine threat of small airplane accidents occurring in Alameda. Proper planning, preparation and training will help reduce injuries, save the lives of victims and improve firefighter safety. The establishment of a joint labor/management committee will provide evaluation of the plan and related recommendations for changes on an annual basis or as the need arises. The committee will also examine the expansion of this policy to include other types of aircraft in the future.

Training:

Although airplane accidents are infrequent, it is imperative that ongoing training for small plane emergencies be included in the annual training plan because the conditions surrounding such events are critical in nature. Multi-agency training, with exercises focusing on compatibilities and response procedures, should be scheduled for all personnel each quarter.

Pre-planning:

Tours of the OIA layout, identification of flight patterns and examination of

different types of planes should be included in pre-planning efforts. Briefings focused on aircraft fuel, electrical and oxygen systems should be provided. A skills and equipment evaluation should be performed for applicability and training lesson plan development.

An emergency landing at the abandoned airport at Alameda Point is a possibility for a distressed aircraft. Fire crews should know how to get out to the runway area quickly and prepare for transportation of victims.

A communications system between the OIA tower, OIA Fire Department and AFD should be established and tested daily. A plan for communications on the scene to include outside agencies that may respond should be prepared.

Mutual aid agreements with agencies that are likely to respond such as the United States Coast Guard, Oakland Fire Department and Alameda County Search and Rescue should be established.

A grid map that includes prominent local features, access routes, staging areas and medical facilities out to five miles from center of the airport should be developed. The abandoned runway at Alameda Point should be included in the grid map. The grid map should then be distributed to the airport and surrounding agencies that may respond to Alameda for this type of incident.

A resource list of equipment that may be used for this type of incident should be developed.

Response Procedures:

There are numerous response considerations that have been derived from experiences in past aircraft incidents. The following procedures are not presented in any order and are intended to be followed only as appropriate for scene conditions:

- Quick response times and appropriate fire suppression operations are critical factors in saving lives.
- A standard AFD response to a small aircraft emergency should be three engine companies (one being the engine with foam tanks), one truck company, two ambulances and one Division Chief.
- The creation of a safe path for victims to escape is a tactical priority.
- When arriving at the scene care must be taken to look for victims outside the aircraft and airplane parts that may be lying in the path of the

apparatus. Proper apparatus placement should consider wind and topography while still being in a position to cover both sides of the aircraft with the large monitor or hose lines.

- **Establishment of scene command, command post location and staging area should be established uphill and upwind of the incident. Incoming units should be notified of the staging area and routing into the incident.**
- **Appropriate resource and scene management employing the Incident Command System should be utilized during all phases of the incident.**
- **If an airplane has landed or crashed in Alameda the OIA should be notified that the City of Alameda has an "Alert 1" and a mutual aid engine with foam should be requested. The following information should be given if available: location of incident; command post and staging area locations; aircraft make, model, year and identification numbers; number of victims, and the pilot's name, address, birth date and phone number.**
- **Because the fuel that is most common used by general aviation aircraft is 100 octane, there is a high probability of fire if the fuel tanks are compromised and an ignition source is present. This fuel will burn hotter than a normal structure fire so good judgement must be exercised. All ignition sources must be eliminated whenever possible. The fuel shut-off should be located and turned to the "off" position. Proper application of foam can reduce the threat of, or extinguish a fire. All standing fuel should be covered with foam.**
- **Keeping fire away from the fuselage and victims is a tactical priority. If foam is not available the response team should be prepared to use large quantities of water to control a fire. A secondary source of water supply should be established early in the incident. Personnel should consider fuel runoff and fires that could occur downstream.**
- **Every crash should be considered a crime scene. Minimal intervention should be made, leaving the accident site as intact as possible. Response personnel in the immediate crash area should be kept to a minimum. Videotaping and photographs should be taken at the scene to assist investigators in recreating the actual conditions of the incident. The original layout of the scene and aircraft, including deceased victim location and position, should be documented. It may be necessary to preserve the chain of evidence by keeping responders on scene.**

- If the aircraft is located in water, rescue divers with specialized equipment may be necessary. The Alameda Sheriff Search and Rescue Team and the Coast Guard should be notified. The AFD fire boat and water rescue craft should be dispatched to the scene. Land-based engine companies should respond as close as possible to the last point seen with water rescue surfboards and related equipment. Responders should attempt surface water rescues from boats or shore. It should be assumed that fuel will be present in the water and necessary precautions should be taken. Foam blankets on fuel can reduce the risk of fire.
- Personal protective clothing guidelines, including the use of nomex hoods, should be followed at all times.
- Any time victims or responders are in or near the aircraft a firefighter with full protective clothing and self contained breathing apparatus should be in place with a charged hose line.
- When extrication is being performed the location of internal fuel and oxygen lines must be considered. Responders should shut down the electrical system using the master switch and isolate the battery. An oxygen system, if present, should also be isolated. Non-standard resources, both mutual aid (interpreters, etc.) and equipment (cranes, etc.), may have to be utilized. Appropriate cribbing and shoring materials need to be available. The propeller shaft is one of the strongest points of a small aircraft and can be used for stabilization; however, care should be taken to stay away from the path of the blades, even when the engine is not running.
- Scene communications may be difficult depending on the number of outside agencies that may respond. Enhanced communications in this case can be accomplished through portable and mobile radios, megaphones, cell phones, messengers and any other means available.
- Special considerations should be given to any cargo on board the involved aircraft. It could be illegal or hazardous to personnel.
- The response team should be prepared to treat burns, trauma injuries and smoke inhalation. Current policies concerning proper precautions for blood borne pathogens should be adhered to. Patients should be assessed using the standard triage methods and triage tags should be used before moving them to a treatment area close to the loading area for ambulances.

Demobilization/Rehabilitation:

- Crews should be rotated and given rest whenever appropriate.
- A critique should be scheduled as soon as possible after the incident to identify successes and address deficiencies.
- Critical Incident Stress Debriefing should be considered.